aluminum oxide, titanium oxide, zirconium oxide, niobium oxide, or magnesium oxide. By adjusting the ratio between the conducting and insulating components, the resistance of the mixed material can be tuned precisely. The material with high secondary electron emission (ϵ) can be, for instance, ALD aluminum oxide (ϵ=6) or magnesium oxide (ϵ=3).

[0041] In addition to performing these electronic functions, the ALD coatings will also serve the mechanical function of sealing off the intrinsic pores of the AAO (~20-40 nm) leaving only the micropores used for amplification. This will reduce the surface area of the MCP plates **40** thereby lowering the outgassing under high vacuum. In addition, it will improve the response uniformity of the device by eliminating any signals originating from the intrinsic pores. The conformal ALD films **30** will also assist in smoothing out sharp surfaces produced during the chemical etching step (FIGS. **8** and **9**) thereby reducing field emission when bias is applied to the MCP plates **40**.

[0042] Controlled ALD methods can be used to further process the MCP plates **40**. Materials can be deposited at precise depth locations. These methods allow "stripes" of one or more material with different compositions to be applied at controlled positions along the AAO nanopores **20**. For instance, a stripe of photocathode material **25** can be deposited at the entrance of the nanopores **20**, followed by a material **35** with high secondary electron coefficient. Finally, a metallic anode material **45** could be deposited on the opposite end of the AAO nanopores **20** (see FIG. **12**). In this way, an MCP light sensor form of the MCP plates **40** for a detector could be fabricated using ALD and the AAO membranes **10**. Such a form of the MCP plates **40** for a detector could be located adjacent to a Cerenkov radiation material to detect high energy particles.

[0043] Using ALD to prepare multiple stripes of high secondary electron coefficient material at controlled depth locations within the AAO nanopores **20** will allow fabrication of the MCP plates **40** that function as a discrete dynode chain similar to those used in photomultiplier tubes (PMTs). In general, conventional PMTs are very expensive, and the technology is not scalable to large areas. Both the AAO synthesis and the ALD modification technologies are scalable to large areas and this will make fabrication of the MCP plates **40** more cost effective.

[0044] The resulting MCP plates **40** have much smaller intrinsic channel diameter (less than 1 micron), micro-fabricated pores (1-25 microns), and faster detector response time (less than 100 psec). Hard and mild anodization and surface patterning techniques combined with anodization are applied to fabricate the designed MCP plates **40**. The surface of the nanopores **20** are sensitized with suitable conductive and emissive oxide thin films with preferred use of ALD.

[0045] The foregoing description of embodiments of the present invention have been presented for purposes of illustration and description. It is not intended to be exhaustive or to limit the present invention to the precise form disclosed, and modifications and variations are possible in light of the above teachings or may be acquired from practice of the present invention. The embodiments were chosen and described in order to explain the principles of the present invention and its practical application to enable one skilled in the art to utilize the present invention in various embodiments, and with various modifications, as are suited to the particular use contemplated.

What is claimed is:

1. A micro-channel plate detector, comprising:

an anodized aluminum oxide membrane having a plurality of nanopores therethrough; and

a thin layer disposed within at least a portion of the plurality of nanopores and the nanopores being open and unplugged, the thin layer being a continuous layer of conductive and emissive oxide material responsive to incident radiation, thereby providing a plurality of radiation sensitive channels for the micro-channel plate detector.

2. The micro-channel plate detector, as defined in claim **1**, further including an Al coating applied to at least a portion of the anodized aluminum oxide membrane.

3. The micro-channel plate detector, as defined in claim **1**, wherein the emissive oxide material comprises an atomic layer deposited material.

4. The micro-channel plate detector, as defined in claim **1**, wherein the nanopores have a diameter of about 10 nm to 500 nm.

5. The micro-channel plate detector, as defined in claim **4**, wherein the plurality of nanopores have a substantially uniform diameter.

6. The micro-channel plate detector, as defined in claim **1**, wherein the radiation sensitive channels have a diameter selected from the group of less than about 1 micrometer and about 1-25 micrometers.

7. The micro-channel plate detector, as defined in claim **1**, further including a texture applied to an Al coating applied to the micro-channel plate detector.

8. The micro-channel plate detector, as defined in claim **7**, wherein the texture comprises a faceted layer.

9. The micro-channel plate detector, as defined in claim **8**, wherein the faceted layer includes a bias angle.

10. The micro-channel plate detector, as defined in claim **2**, wherein an Al/anodized aluminum oxide interface is selected from the group consisting of a sharp interface and a graded interface.

11. The micro-channel plate detector, as defined in claim **2**, further including additional patterned layers on the Al coating for the radiation sensitive channels.

12. The micro-channel plate detector, as defined in claim **1**, further including a funnel-shaped channel entrance.

13. The micro-channel plate detector, as defined in claim **1**, wherein the emissive oxide material comprises a mixture of a conducting oxide and an electrically insulating oxide, the conducting oxide selected from the group consisting of zinc oxide, tin oxide and indium oxide, and the electrically insulating oxide selected from the group consisting of aluminum oxide and magnesium oxide, thereby enabling tuning of electrical resistance of the emissive oxide.

14. The micro-channel plate detector, as defined in claim **3**, wherein the anodized aluminum oxide includes intrinsic pores sealed by the atomic layer deposited material.

15. A method of preparing a micro-channel plate detector, comprising the steps of:

preparing an anodized aluminum oxide membrane having a plurality of nanopores extending therethrough;

depositing an Al layer on the anodized aluminum oxide membrane; and

depositing a thin, continuous layer of an emissive oxide on the Al layer, including the nanopores, by atomic layer deposition.

16. The method, as defined in claim **15**, further including the step of creating a a texture on the Al layer.